

## State and Tasks of the Chemistry of Synthetic Substances SOV/30-58-7-3/49

Polyethylene, e.g., obtained by means of old methods, had a melting temperature of  $125^{\circ}$ , whereas obtained by the new methods it exhibits a melting temperature of  $170^{\circ}$ . Amongst the high-temperature resistive polymers, polytetrafluoroethylene is of interest. Unsaturated polyether-resins were largely used for the manufacture of large-size products like boats and others. The epoxy-resins (epoksidnyye smoly) will play an important rôle in the manufacture of synthetic materials. The research work carried out in the field of the synthesis of organic fluorine — containing polymeric compounds should also be intensified. The production of inoculated and block polymers is also of great interest. A.N. Nesmeyanov and his collaborators are occupied with the investigation of ferrocene compounds. The synthesis of organic polymers which does not only utilize chemical bonds, but also intercomplex bindings, is of great interest. Further work carried out in the field of the synthesis of new polymers which are distinguished by high mechanical strength, good electrical properties and which are moisture-resistant are considered to be of special importance. It would also be of importance to produce such polymers that would reduce the quality gap between the existing organic and inorganic

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State and Tasks of the Chemistry of Synthetic Substances SOV/30-58-7-3/49

polymers. Phosphorus, aluminum, titanium, boron, tin, lead, cobalt, nickel and other elements should be used in solving this problem. The modern organic and **elemental-organic chemistry** offers great possibilities in the field of further development of the production of **plastic materials**. 13.

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SOV/62-58-7-20/26

AUTHOR: Mindlin, Ya. I., ~~Andrianov, N. A.~~

TITLE: The Synthesis of m-Trifluoromethyl-Phenyl-Methyl Diethoxy Silane and m-Trifluoromethyl-Phenyl Triethoxy Silane (Sintez m-triflormetilfenilmetildietoksisilana i m-triflormetilfeniltrioksisilana)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye khimicheskikh nauk, 1958, Nr 7, pp. 890-900 (USSR)

ABSTRACT: The present article deals with the synthesis of the phenyl- and phenyl-methyl ethoxy silanes with the trifluoro methyl group in the phenyl radical. In order to synthesize these compounds the authors produced benzotrifluoride and trifluoro-antimony in the presence of antimony pentachloride. The synthesis can be represented schematically as follows:

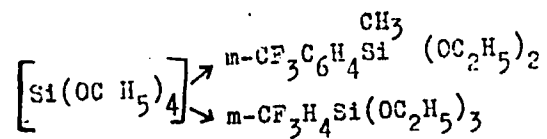
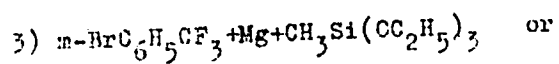
1)  $C_6H_5CCl_3 + SbF_3 \xrightarrow{Sb^{+5}} C_6H_5CF_3$

2)  $C_6H_5CF_3 + Br_2 \xrightarrow{Fe} m-BrC_6H_4CF_3$

Chem 1/2

COV/62-58-7-20/24

The Synthesis of m-Trifluoromethyl-Phenyl-Methyl Diethoxy Silane and m-Trifluoromethyl-Phenyl Triethoxy Silane



There are 2 non-Soviet references.

January 25, 1958

AUTHOR: Andrianov, K. A., Professor, Doctor of SOV/105-58-8-1/21  
Technical Sciences

TITLE: High-Molecular Compounds in Power Engineering (Vysoko-  
molekulyarnyye soyedineniya v energetike)

PERIODICAL: Elektrichestvo, 1958, Nr 8, pp. 1-4 (USSR)

ABSTRACT: A classification of faults occurring in electrical machines shows, that about 70% are caused by a fault in the electric insulation. This analysis shows furthermore, that the average life of electromotors until a general repair is 3'5 years. A combination of the valuable properties of polymers with the thermal stability of glass fiber, mica and asbestos permits to increase considerably the life of electrotechnical equipment. The introduction of this new insulation in pit machinery resulted in a reduction of material expenditure and an increase in coal production. At present high-molecular compounds are produced on a wide range in the USSR for various branches of industry. The most important criterion for the evaluation of the properties and the range of application of an electric insulation is the maximum heat resistivity. Some examples are given for the application of high-molecular compounds in the

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## High-Molecular Compounds in Power Engineering

SOV/105-58-8-1/21

different grades of insulation quality. The thermal resistivity (temperature stability) of organic, fluoro-organic, organosilicon, and of synthetic polymers is dependent upon the chemical composition and the structure of the polymers. Polyorganosiloxanes and polytetrafluoro ethylene exceed all other organic polymers as to thermal resistivity. Computations of the activation energy showed, that it is equal to 36 kcal/Mol at a destruction by thermooxidation and 33,0 kcal/Mol at an electric disruption of the coatings. In organic polymers this energy amounts to 25,7 kcal/Mol in glycol sebacinate in the first case and 26,0 kcal/Mol in glycol terephthalate. In the second case it amounts to 24,8 kcal/Mol in glycol-terephthalate. The activation energy is somewhat lower in other organic polymers. Besides, polyorganosiloxanes exhibit high electric properties and are damp-proof. The highest thermal resistivity among elastic organic polymers is shown by polyesters on a basis of polyatomic alcohols, of terephthalic, isophthalic, and adipinic acid and polyesters modified by polyorganosiloxanes. For electric insulation with an operational temperature of 120°C polyvinyl acetal resins, polyurethanes, epoxy resins must be extensively used in the production of

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High-Molecular Compounds in Power Engineering

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lacquer wires. Polyesters with a linear molecular structure of the "Lavsan" type must be primarily used for the slot insulation of machines, for wire insulation etc. Polyamide resins must be used for grade A insulation at an operational temperature of  $105^{\circ}$ . At this temperature mostly isotactic polymers must be used. There are 2 tables and 5 references, 3 of which are Soviet.

SUBMITTED: June 2, 1958

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1. Electrical equipment--Insulation | 2. Insulation (Electric)           |
| --Production                        | 3. Organic compounds--Applications |

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SOV/62-58-8-5/22

AUTHORS: Andrianov, K. A., Volkova, L. M.

TITLE: The Synthesis and Investigation of the Properties of Liquid  
1-n-Hexamethyl (Polyphenyl-Aminomethyl-Methyl)Siloxane  
(Sintez i issledovaniye svoystv zhidkikh 1-n-geksametil  
(polifenilaminometilmetil)siloksanov)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye khimicheskikh nauk,  
1958, Nr 8, pp. 941-948 (USSR)

ABSTRACT: There have been little publications on organo-silicon liquid  
polymers with polar groups in the organic radical. In the intro-  
duction the authors mention various papers (Refs 1-6) dealing  
with these problems. The synthesis of liquid polyorganosiloxanes  
with amino nitrogen in the organic radical at the silicon atom  
is not only of theoretical interest but has also practical  
value (the production of polymer liquids of valuable technical  
properties). In the present paper the authors describe the  
production of organosilicon liquid polymers (of the degree of  
polymerization  $n=1,2,3$ ) with trimethylsiloxy end groups by  
means of the common hydrolysis (co-hydrolysis) of trimethyl  
ethoxysilane and substituted aminomethylmethyl diethoxysilanes.  
The activation energy of the viscous flow was determined and it

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The Synthesis and Investigation of the Properties of Liquid 1-n-Hexazethyl-  
(Polyphenyl-Aminomethyl-Methyl)Siloxane

was found that this activation energy depends on the structure of the group introduced into the radical. The groups investigated are (arranged according to their decreasing activation energy):  $\text{ClC}_6\text{H}_4\text{NH} > \text{C}_6\text{H}_5\text{NH} > \text{C}_6\text{H}_5\text{C}_2\text{H}_5\text{N} > (\text{C}_2\text{H}_5)_2\text{N}$ . There are 4 figures, 1 table, and 7 references, 1 of which is Soviet.

ASSOCIATION:

Institut elementoorganicheskikh soyedineniy Akademii nauk SSSR  
(Institut of Elemental-Organic Compounds, AS USSR)

SUBMITTED: , January 28, 1957

Card 2/2

SOV/62-58-8-14/22

AUTHORS: Andrianov, K. A., Nikitenkov, V. Ye., Kukharovich, L. A.,  
Sokolov, N. N.

TITLE: The Synthesis of Organosilicon Compounds With Phenylene-Siloxane Chains of the Molecules (Sintez kremneorganicheskikh soyedineniy s fenilensiloksanymi tsepyami molekul)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye khimicheskikh nauk, 1958, Nr 8, pp. 1004-1006 (USSR)

ABSTRACT: In the present report the authors describe the first representatives of the compounds with phenylene siloxane chains of the molecules surrounded by methyl groups. These were produced by the authors by means of the action of magnesium on p-dibromobenzene with a subsequent decomposition of the Grignard reagent by dimethyl dichlorosilane. As was found by the experiment the 1,4-bis-(dimethyl chlorosilane) benzene was formed in the reaction carried out. In the investigation of further reactions two condensation products were synthesized (condensation of 1,4-bis-(dimethyl chlorosilane) benzene). In preparing the monomers for the synthesis of compounds with

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The Synthesis of Organosilicon Compounds With Phenylene-Siloxane Chains of  
the Molecules

phenylene siloxane chains surrounded by methyl-phenyl groups,  
the 1,3-(methyl-phenylchloro) disiloxane was separated which  
has hitherto not been described in publications.

ASSOCIATION: Vsesoyuznyy elektrotekhnicheskiy institut im. V. I. Lenina  
(All-Union Institute of Electrical Engineering imeni V. I.  
Lenin)

SUBMITTED: March 1, 1958

Card 2/2

AUTHORS: Andrianov, K. A., Zhdanov, A. A.

SOV/62-56-9-9/26

TITLE: The Reaction of Metals With Hydroxyl-Containing Organo-silicon Compounds (O vzaimodeystvii metallov s gidroksil-soderzhashchimi kremneorganicheskimi soyedineniyami)

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1958, Nr 9, pp 1076 - 1079 (USSR)

ABSTRACT: In the previous papers the authors showed that triethylsilanol can react with aluminum to form aluminum triethylsilanolate with the liberation of hydrogen. The high reactivity of hydroxyl-containing organosilicon compounds toward metals can only be explained by the fact that the silicon atom in these compounds exhibits a high degree of polarizability. The authors were interested in investigating the reactivity of several polymers of organosilicon compounds which had hydroxyl groups at the silicon atom. It was found that in the reaction of these compounds with metallic sodium, magnesium, and aluminum that hydrogen was liberated and a metal siloxane was formed. The reactivity of the siloxy-con-

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The Reaction of Metals With Hydroxyl-Containing  
Organosilicon Compounds

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taining organosilicon compounds depends upon the re-  
sistivity at these hydroxyl groups. Compounds which  
enter into intermolecular condensation reactions easily  
do not react with metals. On the other hand, hydroxyl  
groups which are resistive to condensation reactions  
react relatively easily with metals. There are 6 tables  
and 4 references, 2 of which are Soviet.

ASSOCIATION: Institut elementoorganicheskikh soedineniy Akademii nauk  
SSSR (Institute of Element<sup>al</sup>-organic Compounds, AS USSR)

SUBMITTED: February 5, 1957

Card 2/2

29-58-6-18/19

AUTHOR: Andrianov, K. A., Corresponding Member of the AS USSR

TITLE: Amazing Silicon... (Chudesnyy kremniy)

PERIODICAL: Tekhnika Molodezhi, 1958, Vol. 26, Nr 6,  
pp. 37 - 39 (USSR)

ABSTRACT: The chemistry of the organic silicon compounds is one of the youngest branches of technology. Its development started in USSR in the years 1935 - 1938. These compounds which are at present produced in industry, are used in the various fields of national industry in the form of heat and frost-resisting materials, of electroinsulating and refractory lacs as well as so-called siliconorganic fluids, oils, lubricants, rubbers and resins. At present excellent electric insulating materials are produced on the basis of siliconorganic resins as well as different lacs which can stand a working-temperature of 180-200°C and a short temperature of 350 - 400°C. The siliconorganic rubber stands temperature fluctuations of -60° up to + 250°C. Fluid siliconorganic polymers are well known. An exceptionally wide intervall of the working temperatures and other precious

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Amazing Silicon.

29-58-6-18/19

properties make it possible to use those polymers in the various fields of technology. In most of the cases the fluids are used as lubricants. Thanks to the siliconorganic oil, the weight of the apparatus can be reduced in the hydraulic system of the aeroplanes. The siliconorganic fluids are used in the case of visorapparatus, motors, timing relays, radiolocation devices of the navy, etc. They can also serve as lubricants for sintermolds as well as molds for rubber substances. One of the most important possibilities of application is the covering and soaking of various materials with those fluids in order to make the material water repellent. Lenses and optic glasses are also being covered with those fluids in order to guarantee a better light transmittance and to protect them against atmospheric influences. Cement, soaked with siliconorganic fluid makes the brick wall waterproof. Because of their high surface activity those fluids can be used to avoid foam formation in various media. Polyorganic siloxanes are used as heat and weatherresisting corrosion preventives for steel, aluminum and other metals. The polymers described in this article are not only interesting from the practical point of view. Siliconorganic

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### Amazing Silicon

polymers which contain anorganic elements in their molecule chains, represent a group of substance which are the first representatives from the little known border area between organic polymers and anorganic substances. The organic polymers which have especially precious elastic properties lack resistance to heat, the anorganic polymers on the other hand lack elasticity. It would be the chemists' task to penetrate deeper in that border area. New polymers could be produced there, combining all these precious properties. There are 9 figures.

1. Silicon compounds--(Organic)--USSR
2. Silicon compounds (Organic)  
--Properties
3. Silicon compounds--(Organic)--Applications

Card 3/3



AUTHOR: Andrianov, K.A. (Moscow)

SOV/74-27-11-1/5

TITLE: Elemental-organic Polymeric Compounds  
(Elementoorganicheskiye polimernyye soyedineniya)

PERIODICAL: Uspekhi khimii, 1958, Vol 27, Nr 11, pp 1257-1303 (USSR)

ABSTRACT: The so-called organosiloxanes have been known and polymerized for quite some time. The investigation of these substances proved to be extremely important since they show high thermal stability and viscosity, qualities required in modern techniques. They are substances with the inner component  $-\text{Si}-\text{O}-\text{Si}-$  framed by radicals. The formation of the poly-siloxanes takes place in general as follows: first, complete or partial hydrolysis of organosilanes, and then polycondensation

$$\text{XSiX} + 2\text{H}_2\text{O} \rightarrow \text{HO}-\text{Si}-\text{OH} + 2\text{HX}; \quad -\text{Si}-\text{OH} + \text{HO}-\text{Si}- \rightarrow -\text{Si}-\text{O}-\text{Si}- + \text{H}_2\text{O}$$

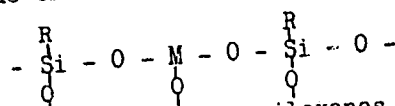
under the action of acid or alkaline catalysts. Hydrolysis is carried out continuously according to the countercurrent principle. Basic products the radicals of which are branched (increase in stability) are stressed. Cyclic radicals are not especially suited for this purpose. Certain methods of producing polymers are

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# Elemental-organic Polymeric Compounds

mentioned. One method consists in forming polymers from monomeric organosilicic acids, or from organosilicic compounds with terminal OH groups with alkyl halides under a separation of HCl. Thermo-oxidations and polycondensations with atmospheric oxygen have been investigated as well as oxidations by applying a sound field. Linear polymeric chains were equally synthesized from cyclic monomers of organosiloxanes. The highest molecular weight which could be obtained was 1 290 000. Plastic substances have a molecular weight of 144 000 - 408 000. All molecular weights lower than the above mentioned belong to liquid substances. By means of the Riggin equation (Ref 195) an assumption on the nonuniform structure of the polymers was made. Furthermore, polyorganic metallic siloxanes are mentioned, the chain unit of which is based on the following basic scheme:



i.e. polyorganic aluminum siloxanes, boron siloxanes, siloxanes containing titanium, tin, lead, zirconium, antimony, phosphorus, germanium. Finally, also simple elementorganic polymers are described.

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Elemental-organic Polymeric Compounds

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They contain metals directly linked to the radical. The methods of their production are not yet sufficiently elaborated. The formation of an aluminum resin, in which compounds with affiliated chains are formed over aluminum, is of interest. Also a boron ether with an ionic basic component is mentioned. It is said in general that ramified polymers have higher stability. Stability, solubility, viscosity equally depend on the diversity of the substituted radicals (Tables). There are 5 figures, 5 tables, and 320 references, 46 of which are Soviet.

Card 3/3

ANDRIANOV, K. P.

AUTHORS:

Andrianov, K. A., Levshuk, M. Ya., Golubtsov, S. A., and Krasovskaya, T. A. 70-2-11/64

TITLE:

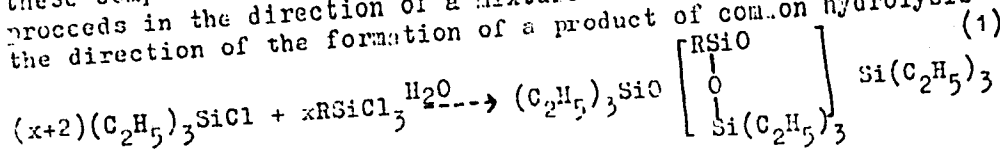
On the Common Hydrolysis of Mono- and Trifunctional Alkyl(Aryl) Chlorine Silanes (O sovmeestnom gidrolize mono- i trifunktsional'nykh alkil(aryl)khlorosilanov)

PERIODICAL:

Zhurnal Obshchey Khimii, 1958, Vol. 28, Nr 2, pp. 333 - 336 (USSR)

ABSTRACT:

The synthesis of most polymeric organosilicon compounds of the type of polyorganosiloxanes takes place by means of a common hydrolysis of two, sometimes more, monomeric organosilicon compounds - alkyl- or alkylchlorosilanes or substituted ethers of orthosilicic acid. It is usually assumed that in a hydrolysis of mixtures of two alkylchlorosiloxanes a polymeric product of the common hydrolysis of these compounds forms. The authors found that the reaction often proceeds in the direction of a mixture of two polymers and not in the direction of the formation of a product of common hydrolysis

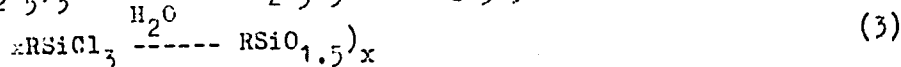
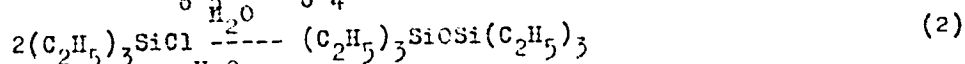


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79-2-11/64

On the Common Hydrolysis of Mono- and Trifunctional Alkyl(Aryl) Chlorine Silanes

where R = C<sub>6</sub>H<sub>5</sub> or C<sub>6</sub>H<sub>4</sub>Cl.



As the test showed, neither the change of the molar interactions and the acid content of the medium nor the use of one or the other solvent in the hydrolysis were capable of suppressing reactions (2) and (3) and leading the process toward the formation of a common product of hydrolysis according to reaction (1). It was assumed that the temperature coefficients of the reaction velocity are different. A test confirmed this assumption and showed that the performance of the hydrolysis at higher temperatures promotes the production of products of the common hydrolysis, but not the mechanical mixture of two polymers. There are 2 figures, 2 tables, and no references.

SUBMITTED: January 19, 1957  
 AVAILABLE: Library of Congress  
 Card 2/2

AUTHORS: ~~Andrianov, K.~~ Dzhenchel'skaya, S., 79-28 3-27/61  
Petrashko, Yu.

TITLE: The Catalytic Polymerization of Polyphenyl- and Poly-  
(Dimethyl-Phenyl) Siloxanes (Kataliticheskaya  
polimerizatsiya polifenil-i poli (dimetilfenil)siloksanov)

PERIODICAL: Zhurnal Obshchey Khimii, 1958, Vol. 28, Nr 3, pp. 685-689  
(USSR)

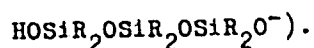
ABSTRACT: Polyorganosiloxanes are obtained by the hydrolysis of  
alkyl(aryl)halosilanes or alkyl(aryl)alkoxysilanes with  
subsequent condensation of the products of hydrolysis. During  
the hydrolysis, reactions occur which lead to the formation  
of linear or cyclic polymers. With excess water cyclic polymers  
in acidous medium result with good yields. In the hydrolysis  
of the difunctional monomers (of dimethylchlorosilane,  
phenylmethyldichlorosilane) low-molecular cyclic products  
were separated -trimers, tetramers and higher cycles  
(ref. 1). The cyclic compounds obtained can regroup in the  
presence of catalysts (sulfuric acid, antimony pentachloride,  
caustic potash, iron chloride), the cycles being ruptured. The

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The Catalytic Polymerization of Polyphenyl- and Poly-  
(Dimethyl-Phenyl)Siloxanes

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polymerization of the cycles obtained from dimethylchlorosilane occurs with an action of alkalies according to the given scheme (final product



Recently, it was found that in the hydrolysis of three-functional compounds in acidous medium also cyclic polymers are formed. In the hydrolysis of ethyltriethoxysilane and pentachlorophenyltrichlorosilane crystalline cyclic polymers of the mentioned cubic structure were separated: in the common hydrolysis of phenyltrichlorosilane with dimethyldichlorosilane in acidous medium also cyclic polymers of the mixed type (see formula A) are formed. As the conversions of tri- and di-functional alkyl (aryl)haloidsilanes in to polymers are of great interest the authors tried to explain the reaction of alkaline catalytic polymerization of cyclic compounds obtained in the hydrolysis of phenyltrichlorosilane as well as the products of the common hydrolysis of phenyltrichlorosilane with dimethyldichlorosilane. It was found that

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The Catalytic Polymerization of Polyphenyl- and Poly-  
(Dimethyl-Phenyl)Siloxanes

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the poly-dimethylphenylsiloxanes polymerize more easily than the polyphenylsiloxanes; octomethylcyclotetrasiloxane polymerized under the influence of small amounts of caustic potash only when heated. In this the effect of the amount of caustic potash on the velocity of gel formation, the dependence of the viscosity of the initial products on the polymerization period with various amounts of caustic potash and the effect of the concentration of the solutions of the polymer in toluene on the velocity of increasing viscosity were determined (see the three diagrams). There are 3 figures, and 6 references, 2 of which are Soviet

SUBMITTED: February 2, 1957

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ANDRIANOV, K. A.

Status of and problems in the chemistry of plastic materials. Vest.  
AN SSSR 28 no. 7:19-25 J1 '58. (MIRA 11:7)

1. Chlen-korrespondent AN SSSR.  
(Plastics)

12ND R12NGU A.P.

110-1-12/19

AUTHORS: Andrianov, K.A., Corresponding Member of the Ac.Sc. USSR  
and Fronberg, E.P., Engineer.

TITLE: Heat-resisting Low-Temperature Drying Electrical Insulating  
Enamels (Teplostoykiye elektroizolyatsionnyye emali  
nizkotemperaturnoy sushki)

PERIODICAL: Vestnik Elektromyshlennosti, 1958, Vol.29, No.1,  
pp. 57 - 62 (USSR).

ABSTRACT: Most polyorgano-siloxanes require a curing temperature  
of about 200 °C and it is, therefore, desirable to develop  
materials of this type that can be cured at lower temperatures.  
This can be done by the use of catalysts, particularly the  
naphthenates of lead, magnesium, cobalt and zinc and also  
oleates of various metals. In the enamels, that were developed,  
the binder consisted of poly-methyl-phenyl-siloxane resins  
which are products of combined hydrolysis and subsequent poly-  
condensation of di- and tri-functional methyl (phenyl) haloid  
silanes.  
In the presence of catalysts, poly-methyl-phenyl-siloxanes  
react at low temperatures and are gradually converted to an  
insoluble gel. The chemical reactions that occur during this  
process may be oxidation leading to cross-linkage, poly-  
condensation resulting from interactions between two Si-OH

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ASSOCIATION: VEI

110-1-12/19

# Heat-resisting Low-Temperature Drying Electrical Insulating Enamels

groups with the evolution of water, or regrouping of the chains of poly-methyl-phenyl-siloxanes accompanied by breakdown of siloxane links and the formation of a cross-link structure by polymerisation.

Bi-valent metals in the catalysts promote oxidation but this is not the main process of hardening of poly-methyl-phenyl-siloxanes in the presence of catalysts at temperatures up to 150 °C. This statement is confirmed by the fact that salts of metals which cannot form higher oxides nevertheless have some catalytic effect. Poly-condensation resulting from the interaction of hydroxyl groups is always accompanied by a reduction in the content of OH groups as the viscosity of the polymer increases. However, determination of OH groups and water in the polymer during the process of interaction between poly-methyl-phenyl-siloxanes and lead naphthenate at 20 °C shows that increase in the viscosity of the polymer solution is not accompanied by reduction in the quantity of hydroxyl groups (see Table 1). Therefore, poly-condensation processes do not occur at this temperature.

Therefore, the main reaction during hardening in the presence of catalysts at low temperature must be re-grouping of the polymer chains with conversion of cyclic links into linear

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# Heat-resisting Low-Temperature Drying Electrical Insulating Enamels

molecules with branched or net-like structure. The possibility of poly-condensation by the interaction of hydroxyl groups cannot be completely excluded.

Heat-resistant electrical insulating enamels [K]-19 and [K]-22 which, in the presence of catalysts harden at a temperature of 120 °C, were developed on the basis of poly-methyl-phenyl-siloxane resins modified by polyether. The properties of these products are described.

The duration of hardening depends on the type and quantity of catalyst. It will be seen from Table 2 that the most active catalysts are lead naphthenate and the naphthenate of lead and manganese. Table 3 shows that the use of hardening accelerators leads to some reduction in the thermal elasticity of the resin films. The naphthenate of lead and manganese gives the best overall results.

The low-temperature-drying enamels are very hard. At 120 °C, in the presence of naphthenate of lead and manganese, they dry much harder than enamels drying at temperatures of 180 °C (see Fig.4). The use of surface-active materials as catalysts improves the adhesion of the lacquers to steel.

The enamels have good dielectric properties, as will be seen

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## Heat-resisting Low-Temperature Drying Electrical Insulating Enamels

from Table 5, which gives the volume resistivity and electric strength of enamel films. The good properties are well maintained after prolonged thermal ageing, as will be seen from Fig.6. The dielectric properties of the enamels are little affected by temperature or humidity. Resistivity and electric strength curves as functions of temperature and time are given in Figs. 1, 2 and 3.

The resins harden slowly in the presence of catalysts even at a temperature of 20 °C, but pigmentation retards this process. The data given in Table 7 and Fig.4 show that in the presence of a low-activity accelerator, the viscosity of enamel 1K9-19 hardly changes after several months and if a more active catalyst, such as lead naphthenate or naphthenate of lead and manganese, is used, the increase of viscosity and the formation of gel takes place much more slowly than in unpigmented lacquer. In practice, it is best to mix in the accelerator immediately before use.

These lacquers are recommended for the insulation of electrical machines working in moist conditions at temperatures up to 180 °C.

Card 4/5 There are 7 tables, 4 figures and 6 references, 4 of which are Russian, 1 German and 1 English

*ANDRIANOV, K.A.*

110-3-11/22

AUTHORS: Andrianov, K.A., Corresponding Member of the Ac.Sc. USSR,  
Rokitskaya, M.S., Candidate of Chemical Sciences, and  
Karina, T.L., Engineer.

TITLE: Polyurethane Electrical Insulating Compounds (Poliuret-  
 anovyye elektroizolyatsionnyye kompaundy)

PERIODICAL: Vestnik Elektromyshlennosti, 1958, Vol.29, no.3,  
 pp. 53 - 56 (USSR).

ABSTRACT: For the impregnation of radio components, compositions  
 based on unsaturated polyesters and epoxy resins have been  
 used successfully. At present, fairly extensive industrial  
 use is made of high-molecular-weight compounds obtained from  
 di-isocyanates. Di-isocyanates are very reactive, and by  
 reacting them with polyfunctional hydroxy compounds, poly-  
 urethanes are formed. These substances do not melt, do not  
 dissolve in organic solvents and the reaction takes place  
 without formation of subsidiary products; hence they have  
 been used for casting insulation.

The authors have synthesised and studied the mechanical and  
 electrical properties of polyurethane polymers obtained by  
 the co-polymerisation of di-isocyanates and castor oil in  
 monomers such as styrol, di-chlor styrol, acrylonitrile, methyl  
 methacrylate, di-allylphthalate. The di-isocyanates used

Card1/4

110-3-11/22

# Polyurethane Electrical Insulating Compounds

were toluilene- and 1.6-hexamethylene di-isocyanate. The compounds are prepared as liquids which, after vacuum treatment, can be used to impregnate apparatus. A necessary condition for the production of sound insulation is the absence of any trace of moisture because it reacts vigorously with di-isocyanates.

The electrical properties were determined on standard specimens of 0.9 mm. The polymers have a resistivity of  $10^{11}$   $\Omega$  cm, a power factor at 20°C of 2.5 - 4% and a break-down strength of 27 - 40 kv per mm. Changes in the molar ratio of hexamethylene di-isocyanate to castor oil and in the quantity of styrol has no great influence on the electrical properties of the polymers. A disadvantage of these compounds is the considerable increase in dielectric loss with increase of temperature, which will be seen from a graph in Fig.1. Compounds based on toluilene di-isocyanate, castor oil and styrol have a higher resistivity but also a higher power-factor. The dielectric properties of compounds based on di-isocyanates castor oil and various polymers are given in Table 1. The replacement of styrol by other monomers gives no special advantage. Compounds based on acrylonitril and dichlorostyrol have better electrical properties than those based on

Car62/4

## Polyurethane Electrical Insulating Compounds

110-3-11/22

methacrylate, but cannot be used because dichlorostyrol is not available; also, polyurethane compounds based on acrylonitril develop cracks.

The dielectric properties of polyurethane polymers based on polyesters A and B, di-isocyanates and styrol are given in Table 2. They have good electrical properties, not much affected by temperature.

Polyurethane compounds have been developed and are called K30 and K31. K30 is a co-polymerisation product of 1,6-hexamethylene di-isocyanate, castor oil and styrol. K31 is a co-polymer of toluilone di-isocyanate, castor oil and styrol. The electrical and mechanical properties of the compound are displayed in Table 3. The dielectric loss/temperature curves for the compounds are in Fig.1; these curves are typical of polar substances. Heating these compounds to a temperature of 120 °C has little influence on the slope of the curve or the absolute value of the dielectric loss. The loss is reduced only at high temperatures and after heating for 25 days (see Figs. 2 and 3). The compounds are suitable for impregnation; at room temperature they harden in 2 - 4 days, and at a temperature of 60 - 80 °C they harden in a few hours. They

C1163/4



110-3-11/22

Polyurethane Electrical Insulating Compounds

harden as yellowish opaque substances with very good adhesion to metals and high resistance to moisture. Their main disadvantages are the variation in electrical properties with temperature, the short storage life in the liquid condition, and the toxicity of di-isocyanates. There are 4 figures, 3 tables and 4 references, 3 of which are English and 1 German.

ASSOCIATION: All-Union Electro-technical Institute  
(Vsesoyuznyy elektrotekhnicheskiy institut)

AVAILABLE: Library of Congress  
Card 4/4 1. Insulation-Physical properties

84146

S/112/59/000/013/011/067  
A002/A001

5.3700

Translation from: Referativnyy zhurnal, Elektrotehnika, 1959, No. 13, p. 13,  
# 26248

AUTHOR: Andrianov, K. A., Sokolov, N. N., Golubenko, M. A., Shostenko, G. S.,  
~~Tukina, B. N.~~

TITLE: Direct Synthesis of Alkyl- and Arylchlorsilanes

PERIODICAL: Tr. Vses. elektrotekhn. in-ta, 1958, No. 62, pp. 5-15.

TEXT: The direct synthesis of organic chlorsilanes was suggested by Myuller and Rokhov in 1942-1945. The method is based on the property of elemental Si to enter into a reaction with halogenes and organic halides at higher temperatures, forming chlorsilanes and organic chlorsilanes. Cu is one of the best catalysts in this direct synthesis. The authors discuss the results of experimental data of the direct synthesis obtained at VEI in 1946. Ferrósilicon can be used instead of pure Si. The synthesis of ethyl, vinyl, and phenyl chlorsilanes is described briefly. A theory of the direct synthesis of organic chlorsilanes as a heterogeneous catalysis process at high temperatures has not yet been developed. There are 13 references.  
Translator's note: This is the full translation of the original Russian abstract.  
A. O. M.  
Card 1/1

69247

SOV/112-59-17-35822

247700

Translation from: Referativnyy zhurnal. Elektrotehnika, 1959, Nr 17, p 12 (USSR)

AUTHORS: Andrianov, K.A., Zabyrina, K.I.

TITLE: Silico-Organic and Organic Polymers, and Dielectrics Based on Them

PERIODICAL: Tr. Vses. elektrotekhn. in-ta, 1958, Nr 62, pp 29-42

ABSTRACT: Properties of organic and silico-organic polymers are discussed. The structure of molecules exercises a great influence on properties of polymers. An increased frost-resistance and poor mechanic properties of silico-organic polymers are explained by low polarity and a weak interaction of molecules. The relaxation character of dielectric losses of silico-organic polymers caused by temperature is determined by the polar bond - Si - O -. The silico-organic polymers compared with the organic polymers, have an increased thermoelasticity. Properties and fields of application of some dielectrics based on organic and silico-organic polymers are briefly described. There are 4 references.

A.O.M.

Card 1/1

69248

SOV/112-59-17-35823

24.7700

Translation from: Referativnyy zhurnal. Elektrotehnika, 1959, Nr 17, pp 12-13 (USSR)

AUTHORS: Andrianov, K.A., Dzhenchel'skaya, S.I., Zabyrina, K.I.

TITLE: On the Influence of Oxides and Hydroxides of Metals on the Properties of Electro-Insulating Polyphenylethylsiloxane Films 15

PERIODICAL: Tr. Vses. Elektrotekhn. in-ta, 1958, Nr 62, pp 192-204

ABSTRACT: Polyorganosiloxane polymers begin to be widely used as coatings of metals. Therefore, it is important to study the processes taking place between polyorganosiloxanes and oxides of metals and the influence of these oxides on the properties of films. Heat resistance, the time of drying, hydrophobic degree, thermal convertibility and electric properties of films made of polyphenylethylsiloxane resin as well as of oxides and hydroxides of some metals were studied. Varnish (solvent - toluene) was mixed with various fillers: <sup>15</sup>MgO, MgSO<sub>4</sub>, CaCO<sub>3</sub>, BaSO<sub>4</sub>, ZnO, Al<sub>2</sub>O<sub>3</sub>, Al hydroxide, Cr<sub>2</sub>O<sub>3</sub>, iron minimum Pb<sub>3</sub>O<sub>4</sub>, TiO<sub>2</sub>. The highest rate of gelatinization was observed at introduction into the varnish of red lead and Cr<sub>2</sub>O<sub>3</sub>. A great influence on the increase of the thermoelasticity have MgO and Cr<sub>2</sub>O<sub>3</sub>, Al hydroxide and BaSO<sub>4</sub>. At introduction into polyphenylethylsiloxane resin of mica

Card 1/2

AUTHORS: Andrianov, K. A., Corresponding Member  
of the AS USSR, Zhdanov, A. A., Asnovich, E. Z. 20-118-6-21/43

TITLE: On the Synthesis of Infusible but Soluble Polymers  
(O sinteze neplavkikh, no rastvorimyykh polimerov)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 118, Nr 6,  
pp. 1124-1127 (USSR).

ABSTRACT:

The fusibility and solubility of polymers in organic solvents are considered to be dependent on the molecular structure of the chains. Polymers with a linear structure are soluble and meltable by heating, regardless of their molecular weight. The branching of the chain, viz. the formation of laced (sshitye) structures and spatial structures makes the polymer lose these properties. This dependence concerns all polymers. The authors tested the synthesis of polymers which were readily soluble in non- or slightly-polar solvents but which did not melt when heated. The results obtained by thorough investigations show that no polymers with the aforesaid properties can be obtained with the production of cyclic poly-organo-siloxanes. A general composition of the polymers  $(C_6H_5SiO_{1,5})_x$  which cor=

Card 1/ 4

## On the Synthesis of Infusible but Soluble Polymers

20-118-6-21/43

responds to a cyclic structure of the molecules, was proved during the hydrolysis of phenyltrichlorosilane. Such polymers, however, are soluble in organic solvents and melt when heated. A long lasting heating of the polyphenyl-siloxanes at 250°C and above causes an increase of the melting temperatures, but the polymer loses its solubility at the same time. The polymeric molecule grows apparently in first line due to bursting of the rings and their polymerization under the formation of structures which are laced. For increasing the melting-temperature of the complicated cyclic polyphenyl-siloxanes, aluminum was introduced into the molecule of the polymer. Aluminum-siloxane reacts with phenyl-trihydroxy-silane by precipitating water. A further condensation at the cost of the hydroxyl-groups under formation a polymer with a molecular weight of 5990, a content of hydroxyl-groups of 5,5% and a ratio Si: Al = 4,1. The obtained aluminum-phenyl-siloxane is a colorless, brittle, vitreous substance which does not melt with heating up to 500°C and does not sinter either (figure 1). It is readily soluble in: benzene, toluene, acetone, ethanol, chlorobenzene and carbon tetrachloride, yet insoluble in petroleum ether and white spirit. Though the content of OH-groups in the polymer decreases from 5,53 to 2,7% with a heating at 150°C for 10 hours (reference 1), its solubility remains un-

Card 2/4

3

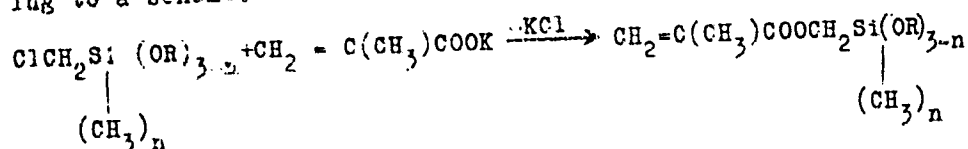
20.119-6.26/56

AUTHORS: Andrianov, K. A. Corresponding Member, Academy of Sciences,  
USSR, Dabagova, A. K.

TITLE: The Synthesis of Organosilicic Compounds Containing a Meth-  
acryl Group (Sintez kremniyorganicheskikh soyedineniy  
soderzhashchikh metakril'nyuyu gruppu)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 119, Nr 6, pp.1149-1151  
(USSR)

ABSTRACT: In the present paper the former investigations (Ref 1) are  
developed. The compounds synthesized contain the mentioned  
group at the silicon atoms: they are methacryl methyl alkoxy-  
silanes and methacryl compounds (tri-, tetra- and penta-  
siloxanes). The afore-mentioned compounds are produced accord-  
ing to a scheme:



Card 1/3

SOV/20-122-3-19/57

AUTHORS: Andrianov, K. A., Corresponding Member, AS USSR, Delazari, N. V.

TITLE: The Synthesis of Some Organosilicon and Organotitanium-Silicon Compounds (Sintez nekotorykh kremniyorganicheskikh i titan-kremniyorganicheskikh soyedineniy)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 3, pp 393-396 (USSR)

ABSTRACT: In investigating the influence of the triaryl-, trialkyl-, and mixed tri(alkyl-aryl) siloxy-groups on the properties of the compound mentioned last in the title the authors found it necessary to synthesize some new derivatives of the latter, i. e. those which contain aromatic and aliphatic radicals in the silicon atom. In order to produce mixed tetrakis/tri(aryl-alkyl) siloxy/titanium compounds the authors synthesized a number of organosilicon compounds. The latter served as initial products for the production of tetrakis/tri(alkyl-aryl) siloxy/titanium compounds. Phenyl-dimethyl chlorosilane and methyl diphenyl chlorosilane were formed according to the Grignard (Grin'yar) reaction. For the production of alkyl-aryl silanols the latter compounds were transformed into acetates. They were then

Card 1/2



SOV/20-122-3-19/57

The Synthesis of Some Organosilicon and Organotitanium-Silicon Compounds

hydrolyzed by means of ammonia solutions. The total scheme of the compounds produced is illustrated by 3 equations. All compounds produced according to this scheme were isolated at each stage of the process and their empirical formulae and the main constants were determined (Table 1). The production of tetrakis/tri(alkyl-aryl) siloxy/titanium compounds was carried out by two methods: 1) By the action of titanium tetrachloride on diphenyl methyl silanol in the presence of ammonia. Thus, tetrakis-(diphenyl methyl siloxy) titanium was produced. At room temperature it is a high-boiling liquid. 2) Tetrakis (dimethyl phenyl siloxy) titanium was produced by means of the reaction of sodium dimethyl phenyl silanolate with titanium tetrachloride (a scheme is given). There are 1 table and 6 references, 2 of which are Soviet.

ASSOCIATION: Institut elementoorganicheskikh sovedineniy Akademii nauk SSSR  
(Institute of Elementary Organic Compounds, AS USSR)

SUBMITTED: June 9, 1958

Card 2/2

Synthetic High Polymers (Cont.)

SOV/2149

on the development of electrical and radio apparatus, and also their role in meeting increased demands for reliable and durable electrical equipment. The preparation, properties and application of high polymers are discussed in brief. No personalities are mentioned. There are no references.

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Fluorine Plastics	12
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5(2,3)

PHASE I BOOK EXPLOITATION

SOV/2195

Andrianov, Kuz'ma Andrianovich, and Aleksey Ivanovich Petrashko

Kremniyorganicheskiye polimery v narodnom khozyaystve (Organosilicon Polymers in the National Economy) Moscow, Izd-vo AN SSSR, 1959. 76 p. (Series: Akademiya nauk SSSR. Nauchno-populyarnaya seriya) 15,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Redkollegiya nauchno-populyarnoy literatury.

Ed. of Publishing House: Ye.I. Volodina; Tech. Ed.: O.M. Gus'kova.

PURPOSE: The book is intended for the general reader interested in the chemistry of synthetics.

COVERAGE: This popular science type booklet describes polymers made from organosilicon compounds. A brief survey of the properties of organic polymers precedes the discussion of polymers made of organosilicon compounds, their characteristics and possible uses in the national economy. Special attention

Card 1/4

Organosilicon Polymers in the National (Cont.)

SOV/2195

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Card 3/4

ANDRIANOV, K. A.

"The Chemistry of Polymetalloorganosiloxanes,"

report presented at the American Chemical Society Meeting, Atlantic City,  
13-18 Sep 1959.

All-Union Electro Chemical Inst, Acad. Sci. USSR.

Abstract of report B-3,142,091,

ANDRIANOV, K. A.

A. I. Glukhova, K. A. Andrianov, L. N. Kozlovskaya and Kalushenina,

"The obtaining of a Rubber-Like Substance from the Polydimethylsiloxane."

S. N. Dzhenchel'shaka, K. A. Andrianov and Yr. K. Petrashko, "The Production of Soluble Polymers with Increased Viscosity."

Report, presented at the Second All-Union Conference on the Chemistry and Practical Application of Silicon-Organic Compounds held in Leningrad from 25-27 September 1959.

Zhurnal prikladnoy khimii, 1959, Nr 1, pp 238-240 (USSR)

ANDRIANOV, K. A.

A. G. Kuznetsova, K. A. Andrianov and D. Ya. Zhinkin, "The Basic Reaction for obtaining Polyorganosilicoxane Resins."

L. M. Volkova, K. A. Andrianov, G. Ye. Golubkov, L. N. Makarova, and V. A. Odinets, "The Introduction of Polar Groups into Organic Radical at the Silicon Atom."

Report presented at the Second All-Union Conference on the Chemistry and Practical Application of Silicon-Organic Compounds held in Leningrad from 25-27 September 1958.

Zhurnal prikladnoy khimii, 1959, Nr 1, pp 238-240 (USSR)

ANDRIANOV, K. A.

A. A. Zhdanov and K. A. Andrianov, "The Synthesis of Polymers with Inorganic Chains."

I. V. Trofimova, K. A. Andrianov and S. A. Golubtsov, "The Synthesis of Trichlorsilane."

Report presented at the Second All-Union Conference on the Chemistry and Practical Application of Silicon-Organic Compounds held in Leningrad from 25-27 September 1958.

Zhurnal prikladnoy khimii, 1959, Nr 1, pp 238-240 (USSR)



SOV/80-59-1-32/44

AUTHORS: Andrianov, K.A., Golubtsov, S.A., Tishina, N.N. and Trofimova, I.V.

TITLE: Direct Synthesis of Phenyltrichlorosilane in a "Fluidized" Bed  
(Pryamoy sintez feniltrikhlorsilana v "kipyashchem" sloye)

PERIODICAL: Zhurnal prikladnoy khimii, 1959, Nr 1, pp 201-207 (USSR)

ABSTRACT: The authors investigated the synthesis of phenyltrichlorosilane out of chlorobenzene, hydrogen chloride and silicon in a "fluidized" bed in the presence of copper and iron as catalyzers at a temperature of approximately 600°C. The experiments performed showed the possibility of attaining the high efficiency of the process, the satisfactory yield of phenyltrichlorosilane, approximately 11 g from 100 g of the contact mass per hour, and sufficiently complete utilization of silicon, ~60%. There are 7 tables and 5 references, 1 of which is Soviet and 4 American.

SUBMITTED: May 29, 1957

Card 1/1

15(8)  
AUTHORS:

Andrianov, K. A., Corresponding Member, SOV/64-59-2-4/23  
AS USSR, Zhinkin, D. Ya., Candidate of  
Technical Sciences, Moiseyev, A. F., Candidate  
of Technical Sciences

TITLE:

Organo-silicic Resins and Varnishes and Their Application  
(Kremniyorganicheskiye smoly i laki i ikh primeneniye)

PERIODICAL:

Khimicheskaya promyshlennost', 1959, Nr 2, pp 106-111 (USSR)

ABSTRACT:

In the USSR organo-silicic resins (OR) are largely used in the production of heat-resistant varnishes. At present, there exist several types of (OR), but only polymethylsiloxane-, polyphenylsiloxane-, polychlorophenylsiloxane-, polymethylphenylsiloxane-, and polyethylphenylsiloxane resins are being used in pure state and changed with organic polymers. Temperature resistance, hydrophobic properties, as well as chemical and oxidation resistance are the most important properties of the varnish- and resin films produced on the basis of (OR). Organo-silicic resins and varnishes exhibit good dielectric properties depending only little on temperature and current frequency. For this reason they are used for electrical insulation. In the USSR the electrical insulation varnishes

Card 1/2

Organo-silicic Resins and Varnishes and Their  
Application

SOV/64-59-2-4/23

of polyethylphenylsiloxane EF-3 and EF-5, polymethylphenylsiloxane K-40, K-41, K-43, K-44, K-47 and K-48 (Ref 31) are the most frequently used. Among a large number of possibilities of combination and application of (OR) for corrosion-proof coatings the heat-resistant enamel varnish Nr 9 and the polydimethylphenylsiloxane enamel varnishes PRKE-13 and PRKE-15 are preferably used in Soviet industries (Ref 31). Plastics on (OR) basis are largely used in the electrical industry, as well as for the production of foam plastics. For their production polymethylphenylsiloxane resins K-40 and K-47, as well as modified (OR) with phenol formaldehyde-, epoxy- and polyurethane ester resins are the most suitable. There are 73 references, 46 of which are Soviet.

Card 2/2

5(3)

SOV/62-59-2-15/40

AUTHORS:

Andrianov, K. A., Volkova, L. M.

TITLE:

On the Reaction of  $\alpha$ -Chloro-methyl Ethoxy-silanes With Amines  
(O reaktsii  $\alpha$ -khlormetiletoksisilanov s aminami)

PERIODICAL:

Izvestiya Akademii nauk SSSR, Otdeleniye khimicheskikh nauk,  
1959, Nr 2, pp 278-282 (USSR)

ABSTRACT:

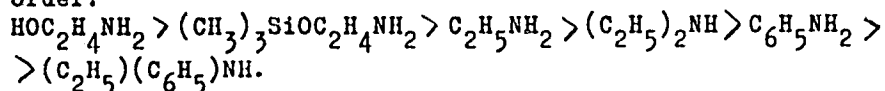
In the present paper the relative reactivity of chlorine in  $\alpha$ -chloro-methyl ethoxy-silanes with various amines was investigated. In contrast with the data hitherto published it was found that chlorine in chloro-methyl ethoxy-silanes is substituted by various amines of the aliphatic and aromatic series at 20°. When ethyl amine is acting on  $\alpha$ -chloro-methyl-dimethyl ethoxy-silane and  $\alpha$ -chloro-methyl-methyl diethoxy-silane, and aniline on  $\alpha$ -chloro-methyl-methyl diethoxy-silane, at 20°, accordingly, ethyl-amino methyl dimethyl ethoxy-silane (65%), ethyl-amino methyl-methyl diethoxy-silane (56%) and phenyl-amino methyl-methyl diethoxy-silane (13.5%), as well as hydrochloric acid, ethyl-amine and aniline were obtained. The first two compounds are new. It was found that the reaction of amines with  $\alpha$ -chloro-methyl ethoxy-silanes at 20° proceeds with dif-

Card 1/2

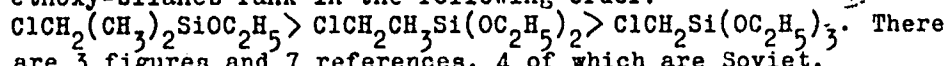
SOV/62-59-2-15/40

On the Reaction of  $\alpha$ -Chloro-methyl Ethoxy-silanes With Amines

ferent velocity, according to the nature of the amine. As to their reactivity the amines investigated rank in the following order:



As to their reaction rate with amines the  $\alpha$ -chloro-methyl ethoxy-silanes rank in the following order:



ASSOCIATION:

There are 3 figures and 7 references, 4 of which are Soviet. Institut elementoorganicheskikh soedineniy Akademii nauk SSSR (Institute of Elemental-Organic Compounds of the Academy of Sciences, USSR)

SUBMITTED: May 23, 1957

Card 2/2

S/081/61/000/007/009/010  
B107/B207

AUTHOR: Andrianov, K. A.

TITLE: Main trends in the chemistry of synthetic dielectrics

PERIODICAL: Referativnyy zhurnal, Khimiya, no. 7, 1961, 557, abstract  
7π84 (7P84) ("Tr. Vses. elektrotekhn. in-ta"; 1959, no. 3,  
3 - 24)

TEXT: This paper gives a survey of some of the most important trends in the synthesis of high-molecular dielectrics with excellent dielectric properties such as: organic polymeric compounds (block and graft copolymers, polymers with carbon-chain molecules containing phenyl rings, linear polycondensation plastics, unsaturated polyesters; fluorine-containing polymers, etc.); polymeric compounds with inorganic molecular chains which were obtained on the basis of polysiloxanes with polar groups in the organic radical; polymeric compounds with organic-inorganic molecular chains; polymeric compounds with organic molecular chains obtained by polymerization of unsaturated organosilicon compounds; mixed

Card 1/2

15.8170

15.8312

211,54

S/081/61/000/007/010/010  
B107/B207

AUTHORS: Andrianov, K. A., Rokitskaya, M. S., Prelkova, A. G.,  
Gribanova, O. I.

TITLE: Polyester organosilicon compounds solidifying at low  
temperatures

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 7, 1961, 557, abstract  
7P91 (7P91) ("Tr. Vses. elektrotekhn. in-ta", 1959, no. 3,  
25 - 36

TEXT: The copolymerization of organosilicon resins (K-48 (K-48), K-47  
(K-47), K-41 (K-41)) which had been modified with unsaturated polyesters,  
styrene, methyl methacrylate, dichloro styrene, was studied; the  
exothermic effect of the polymerization was determined. The dielectric  
properties of the copolymers obtained were studied. As compared with  
polyester-styrene copolymers, their dielectric losses are smaller,  
especially at higher temperatures, but also at higher relative moisture  
(97-2%). The dielectric properties are only little dependent on the  
composition of the resin. The copolymers with styrene show smaller

Card 1/2

5(3)

AUTHORS:

Andrianov, K. A., Makarova, L. I.

SOV/62-59-3-11/37

TITLE:

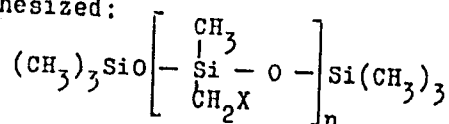
Synthesis and Investigation of Properties of Liquid Polydimethylsiloxanes Containing Ether Groups in Radicals (Sintez i issledovaniye svoystv zhidkikh polidimetilsiloksanov, soderzhashchikh efirnyye gruppy v radikalakh)

PERIODICAL:

Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1959, Nr 3, pp 450-459 (USSR)

ABSTRACT:

In the present paper new liquid, linear organosilicon polymers of different polymerization degree with the following structure were synthesized:



X = -OCH<sub>3</sub>; -OC<sub>2</sub>H<sub>5</sub>; -OCOCH<sub>3</sub>. The properties of these compounds are given in tables 1 and 2. The physical properties of these compounds which were precipitated in pure form, were determined and the dependence of the viscosity on temperature in the range of -20 - +100° was investigated. It was found that the viscosity dependence on temperature increases with the

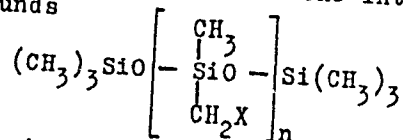
Card 1/2



Synthesis and Investigation of Properties of  
Liquid Polydimethylsiloxanes Containing Ether Groups in Radicals

SOV/62-59-3-11/37

lengthening of the chain of the polymeric molecule (Figs 1,2,3).  
The energy of activation of the viscous flow which was computed for the temperature range of 0-100° according to the equation of Arrhenius depends on the nature of the polar group contained in the molecule. According to the efficacy of their influence upon the forces of the intermolecular interaction in the compounds



the groups investigated may be arranged in the following order  
-NHC<sub>6</sub>H<sub>5</sub> > -OCOCH<sub>3</sub> > -Cl > -OC<sub>2</sub>H<sub>5</sub> > -OCH<sub>3</sub> > -N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub> > -H. There are  
3 figures, 3 tables, and 11 references, 5 of which are Soviet.

ASSOCIATION:

Institut Clementoorganicheskikh soyedineniy Akademii nauk SSSR  
(Institute of Elemental Organic Compounds of the Academy of  
Sciences, USSR)

SUBMITTED:  
Card 2/2

June 13, 1957

5(3)

AUTHORS:

Andrianov, K. A., Odinets, V. A.

SOV/62-59-3-12/37

TITLE:

On the Reaction of Chloro Phenyltrichloro Silane Hydrolysis in Aqueous Media (O reaktsii gidroliza khlorfeniltrikhlorsilanov v vodnykh sredakh)

PERIODICAL:

Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1959, Nr 3, pp 460-465 (USSR)

ABSTRACT:

In the present paper the hydrolysis of chloro phenyl-tri-chloro silanes in aqueous media at 36-38° was investigated. In all experiments solid, brittle polymers were obtained which are easily soluble in organic solvents and possess distinctly marked melting points. After long heating at 200° they retain their thermoplastic properties and good solubility. The analysis of the polymers obtained with regard to the functional groups indicated the absence of chlorine and the hydroxyl groups combined with the silicon atoms. X-ray investigations revealed the occurrence of a crystalline phase. The polymers melt within a small temperature range which is typical of crystalline substances (Table 1). On the basis of analytical data and the determination of the molecular weight the polychloro phenyl siloxanes obtained represent polymers with

Card 1/3

On the Reaction of Chloro Phenyltrichloro Silane  
Hydrolysis in Aqueous Media

SOV/62-59-3-12/37

an average polymerization degree of  $n = 5$ . Irrespective of the small melting range, they possess a considerable polydispersion. This might be the cause of the difficult separation of crystalline products from polychloro phenyl siloxanes. Only in the case of polypentachloro phenyl siloxane 4 crystalline fractions could be separated. These individual crystalline polymers have a steric-cyclic structure  $(Cl_5C_6SiO_{1,5})_n$ .

Cyclic products not only of steric but also of planar structure are probably formed there. The thermoplastic properties of the polymers obtained on hydrolysis of phenyl- and chloro phenyl-trichloro silanes in the case of water excess are due to the formation of cyclic products of steric structure. Such cyclic products have no functional groups and can therefore be transformed into builtup or builtup-steric higher polymer structures by opening of the cycles only. As was shown by the thermal aging of the polyorganosiloxanes obtained from trifunctional monomers, the breaking of the

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-Si-O bond in polymers possessing chain links of  $(RSiO_{1,5})_n$ -

On the Reaction of Chloro Phenyltrichloro Silane  
Hydrolysis in Aqueous Media

SOV/62-59-3-12/37

structure requires very high temperatures (Ref 7). Consequently the stability of the polymers obtained by hydrolysis of phenyl- and chlorophenyl-trichlorosilanes against is, contrary to thermal conversions, determined by steric cycles. There are 3 tables and 7 references, 3 of which are Soviet.

ASSOCIATION: Institut elementoorganicheskikh soyedineniy Akademii nauk SSSR  
(Institute of Elemental Organic Compounds of the Academy of Sciences, USSR)

SUBMITTED: June 25, 1957

Card 3/3

5(3)

AUTHORS:

Andrianov, K. A., Zhdanov, A. A.,  
~~Kazakova, A. A.~~

SOV/62-59-3-13/37

TITLE:

Synthesis of New Polymers With Inorganic Chains of Molecules  
(Sintez novykh polimerov s neorganicheskimi tsepyami molekul)

PERIODICAL:

Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk,  
1959, Nr 3, pp 466-471 (USSR)

ABSTRACT:

In the present paper some reactions of the formation of new polymers with mineral chains of molecules containing aluminum, titanium, phosphorus, and oxygen atoms were investigated. By means of double decomposition of sodium ethyl silanolate with titanium-tetrachloride as well as of sodium trimethyl silanolate with titanium tetrachloride and aluminum chloride dodecamethyl-titanoxy-tetrasiloxane, dodecaethyl-titanoxy-tetrasiloxane and nonamethyl alumoxy-trisiloxane were synthesized. In the investigation of the hydrolytic stability of nonaethyl-alumoxy-trisiloxane it was found that during hydrolysis a simultaneous formation of polyorganosilylalumoxanes - polymers with the elementary group of the formula

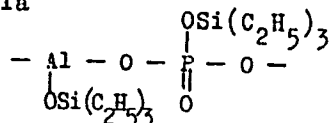
Card 1/2

Synthesis of New Polymers With Inorganic Chains of Molecules

SOV/62-59-3-13/37

- Al - O - takes place. On the interaction of nonaethyl-  
 $\text{OSi}(\text{C}_2\text{H}_5)_3$

alumoxy-trisiloxane with tris-triethyl-silylphosphate poly-  
 organosilylphosphoralumoxanes with the elementary group of  
 the formula



are formed. Similar polymers are also formed in the reaction  
 of nonaethyl-alumoxy-trisiloxane with triethyl-silylphosphoric  
 acid. There are 3 figures, 3 tables, and 5 Soviet references.

ASSOCIATION: Institut elementoorganicheskikh soyedineniy Akademii nauk SSSR  
 (Institute of Elemental Organic Compounds of the Academy of  
 Sciences, USSR)

SUBMITTED: June 25, 1957

Card 2/2

5(3)

AUTHOR:

SOV/26-59-4-3/43  
Andrianov, K.A.; Corresponding Member AS USSR, and Petrashko, A.I. (Moscow)

TITLE:

Silicoorganic Polymers in the National Economy (Kremniyorganicheskiye polimery v narodnom khozyaystve)

PERIODICAL:

Priroda, 1959, Nr 4, pp 9-16 (USSR)

ABSTRACT:

The author describes the vast field of application of silicoorganic polymers, especially polyorganosiloxan, in engineering, medicine, foodstuff and the perfume industry, etc. These polymers containing inorganic elements in the molecular chain are the first representatives of a group lying in the so-called "border zone" between organic polymers and inorganic compounds. Due to their inorganic molecular chain, these polymers approach inorganic compounds, their carbon-containing frame groups, however, link them with the well-known high-molecular compounds. Thus, these polymers combine many valuable properties of both groups, e.g., high resist-

Card 1/2

5(3)

SOV/62-59-9-12/40

AUTHORS: Andrianov, K. A., Zhdanov, A. A.

TITLE: Polyorgano-metallic Siloxanes. Communication 2. Synthesis of the Polyorgano-alumino-cobalt Siloxane and the Polyorgano-alumino Nickel Siloxane

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1959, Nr 9, pp 1590-1594 (USSR)

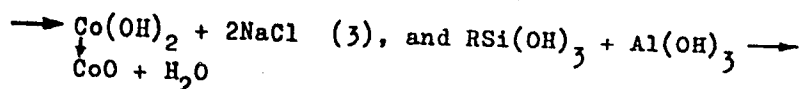
ABSTRACT: The present article describes the development of a method for the synthesis of the metallic silicon-organic polymers, which is based on the composition of the initial substances. The synthesis could be made according to the scheme  $2\text{RSi}(\text{OH})_2\text{ONa} + \text{MeCl}_2 \rightarrow [\text{RSi}(\text{OH})_2\text{O}]_2\text{Me} + 2\text{NaCl}$  (1), at which attention has to be paid to the ratio  $\text{CoCl}_2/\text{AlCl}_3$  in the reacting products in the case of aluminum - cobalt-organic compounds; here in addition to (1) the following secondary reactions occur:  
 $\text{RSi}(\text{OH})_2\text{ONa} + \text{H}_2\text{O} \rightleftharpoons \text{RSi}(\text{OH})_3 + \text{NaOH}$  (2),  $\text{CoCl}_2 + 2\text{NaOH} \rightarrow$

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Polyorgano-metallic Siloxanes. Communication 2. Synthesis of the Polyorgano-alumino-cobalt Siloxane and the Polyorgano-alumino Nickel Siloxane

SOV/62-59-9-12/40



$\rightarrow [\text{RSi(OH)}_2\text{O}]_3\text{Al} + 3\text{H}_2\text{O}$ . Only if this ratio is below unity can Co satisfactorily enter the reaction. Figures 1 and 2 illustrate this dependence. The experimental part of the article describes the synthesis. Tables 1-3 list the analysis data of the products obtained. There are 2 figures, 3 tables, and 3 Soviet references.

ASSOCIATION: Institut elementoorganicheskikh soedineniy Akademii nauk SSSR  
(Institute of Element-organic Compounds of the Academy of Sciences, USSR)

SUBMITTED: January 3, 1958

Card 2/2

ANDRIANOV, K.A.; SLONIMSKIY, G.L.; DIKAREVA, T.A.; ASNOVICH, E.Z.

Solubility and thermomechanical properties of polyaluminum  
organic siloxanes. Vysokom.sped. 1 no.2:244-247 F '59.  
(MIRA 12:10)

1. Institut elementoorganicheskikh soedineniy AN SSSR i  
Vsesoyuznyy elektrotekhnicheskii institut im. V.I. Lenina.  
(Plasticizers) (Siloxanes) (Aluminum organic compounds)

ANDRIANOV, K.A.; YAKUSHKINA, S.Ye.

Polymerization of mixed aryl(alkyl)-cyclotetrasiloxanes. Vysokom  
soed. 1 no. 4:613-618 Ap '59. (MIRA 12:9)

1. Institut elementoorganicheskikh soedineniy AN SSSR.  
(Siloxanes) (Polymerization)

ANDRIANOV, K.A.; ZHDANOV, A.A.; ODINETZ, V.A.

Condensation of silicon organic dicarboxylic keto acids with  
glycol. Vysokom.soad. 1 no.5:704-710 My '59.  
(MIRA 12:10)

1. Institut elementoorganicheskikh soedineniy AN SSSR.  
(Glycols) (Silicon organic compounds)

ANDRIANOV, K.A.; ASNOVICH, E.Z.

Titanium organosiloxane polymers. Vysokom.sped. 1 no.5:743-747  
My '59. (MIRA 12:10)

1. Vsesoyuznyy elektrotekhnicheskiy institut im. V.I.Lenina.  
(Siloxanes) (Titanium organic compounds)

ANDRIANOV, K.A.; ZHDANOV, A.A.

Resistance of titanium, tin and aluminum triethylsiloxane derivatives  
to hydrolysis in the process of polymer formation. Vysokom. soed. 1  
no.6:894-899 Je '59. (MIRA 12:10)

1. Institut elementoorganicheskikh soedineniy AN SSSR.  
(Siloxanes) (Polymerization)

ANDRIANOV, K.A.; DABAGOVA, A.K.

Polymerization of unsaturated organosilicon compounds. Vysokom.  
soed. 1 no.6:930-933 Je '59. (MIRA 12:10)

1. Institut elementoorganicheskikh soedineniy AN SSSR.  
(Silicon organic compounds)  
(Polymerization)

ANDRIANOV, K.A.; NOVIKOV, V.M.

Polymethylbutoxyphosphinaluminoxanes. Vysokom. soed. 1 no.9:1390-1395  
S '59. (MIRA 13:3)

1. Institut elementoorganicheskikh soyedineniy AN SSSR.  
(Phosphorus organic compounds) (Aluminum organic compounds)  
(Polymerization)



ANDRIANOV, K.A.; PETRASHKO, A.I.

Polyaluminodimethylsiloxanes. Vysokom.sped. 1 no.10:  
1514-1518 0 '59. (MIRA 13:3)

1. Institut elementoorganicheskikh soyedineniy AN SSSR i  
Vsesoyuznyy elektrotekhnicheskiy institut im.V.I.Lenina.  
(Siloxanes) (Aluminum compounds) (Polymers)

ANDRIANOV, K.A.; GOLUBKOV, G.Ye.

Structure of 1,n-hexamethylacetoxymethylmethoxysiloxanes and  
their physical properties. Vysokom.socd. 1 no.12:1801-1804  
D '59. (MIRA 13:5)

1. Vsesoyuznyy elektrotekhnicheskiy institut.  
(Siloxane) (Polymers)

ZASYPKINA, P.S.; BELOZEROVA, O.P.; GORNETS, L.V.; MINDLIN, Ya. I.; ANDRIANOV, K.A.

Examination of several hydrophilic polysiloxanes for use as  
foaming inhibitors in the fermentation of antibiotics. Med. prom.  
13 no.2:27-32 P '59. (MIRA 12:3)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut antibiotikov.  
(SILOXANES) (PENICILLIN) (FERMENTATION)

SOV/79-29-2-53/71

AUTHORS: Andrianov, K. A., Ganina, T. N.

TITLE: On Reactions of the Trimethylacetoxy Silane With Tetrabutoxy Titanium and Titanium Tetrachloride (O reaktsiyakh trimetilatsetokssilana s tetrabutoksititanom i chetyrekhkhlolistym titanom)

PERIODICAL: Zhurnal obshchey khimii, 1959, Vol 29, Nr 2, pp 605-608 (USSR)

ABSTRACT: These reactions have hitherto not been investigated although the heterofunctional condensations of the substituted ethers and alkyl silane halides take place easily with alkyl and acrylacetoxy silanes and lead to various mono and polymeric organosilic compounds (Ref 1). It was of interest to employ this method for the synthesis of mixed organotitanium silicon compounds. In the condensation of trimethylacetoxy silane with tetrabutoxy titanium the authors expected the formation of tetra (trimethylsiloxy) titanium according to the scheme

$$4(\text{CH}_3)_3\text{SiOCOCH}_3 + \text{Ti}(\text{OC}_4\text{H}_9)_4 \longrightarrow \text{Ti}[\text{OSi}(\text{CH}_3)_3]_4 + 4\text{CH}_3\text{COOC}_4\text{H}_9$$

The experiments, however, showed that the reaction is of secondary importance. The condensation of tetrabutoxy titanium with trimethylacetoxy silane yielded no tetra(trimethylsiloxy)titanium and served as proof of it. The final products were solid white, nonmelting

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SOV/79-29-2-53/71

On Reactions of the Trimethylacetoxy Silane With Tetrabutoxy Titanium and  
Titanium Tetrachloride

products soluble in alcohol but decomposing at high temperatures. The analyses of these products and their molecular weights indicate formula (I) and (II), i.e. octaacetoxy cyclotetrasiloxane and heptaacetoxy trimethylsiloxy cyclotetrasiloxane. The structure of the compounds (I) was also confirmed by its investigation in the infrared spectrum. Compounds (I) and (II) do not melt until 340°, however, they start decomposing at this temperature; they are soluble in hot alcohol and insoluble in gasoline, benzene, toluene and other solvents. Thus, the condensation of trimethylacetoxy silane with tetrabutoxy titanium did not lead to tetra(trimethylsiloxy)titanium. It is accompanied by the replacement of the butoxy groups by the acetoxy groups at titanium, wherein the above mentioned polymers of cyclic structure are formed. The condensation of trimethylacetoxy silane with  $TiCl_4$  leads to the replacement of the halogens at the titanium atoms by the acetoxy groups. In this reaction, which takes place difficultly, compounds with Ti-O-Si bindings are formed. Tetra(trimethylsiloxy)titanium could not be separated. - There are 2 Soviet references.

Card 2/3

5 (2,3)  
AUTHORS:

Astakhin, V. V., Losev, I. P.,  
Andrianov, K. A.

SOV/79-29-3-32/61

TITLE:

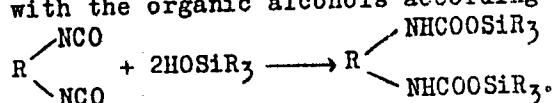
On the Reaction of the Organomonohydroxysilanes With  
Isocyanates (Synthesis of the Organosilicon Urethans)  
{O reaktsii organomonogidroksisilanov s izotsianatami  
(Sintez kremneorganicheskikh uretanov)}

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 3, pp 904-907 (USSR)

ABSTRACT:

It is known from publications that the reaction of the organic alcohols with isocyanates proceeds without separation of by-products. A. Würtz (Ref 1) was the first scientist who proved that the reaction is accompanied by a migration of the hydrogen atom of the hydroxyl group to the nitrogen atom of the isocyanogen group. The authors found (Ref 2), that the trialkyl hydroxysilanes react in the same way with the diisocyanates as with the organic alcohols according to the scheme:

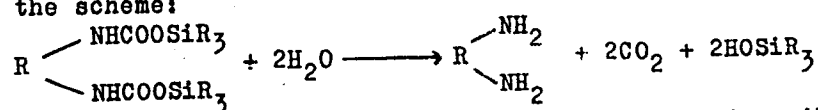


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The compounds obtained were called "organosilicon urethans".

On the Reaction of the Organomonohydroxysilanes With SOV/79-29-3-32/61  
Isocyanates (Synthesis of the Organosilicon Urethans)

They are white, crystalline products soluble in benzene, toluene and ether. The initial organomonohydroxysilanes must not contain water because otherwise polyureas would form (Scheme 2). The organosilicon urethans readily undergo hydrolysis, already with water and without catalysts. In order to prove the structure of the urethans their hydrolytic cleavage reaction was investigated more thoroughly. On the basis of the investigation of the hydrolysis products the cleavage reaction of the organosilicon urethans was found to proceed according to the scheme:



Thus three organosilicon urethans hitherto not described were synthesized and their structure was determined. There are 3 references, 1 of which is Soviet.

ASSOCIATION: Vsesoyuznyy elektrotekhnicheskiy institut imeni V. I. Lenina  
(All-Union Electrotechnical Institute imeni V. I. Lenin)

SUBMITTED: January 24, 1958  
Card 2/2

5(3)

SOV/79-29-4-51/77

AUTHORS:

Leznov, N. S., Sabun, L. A., Andrianov, K. A.

TITLE:

Polydiethylsiloxane Liquids (Polidietilsiloksanovyye zhidkosti).  
I. The Effect of Sulphuric Acid on Diethyldiethoxysilane and  
Its Mixtures With Triethylethoxysilane (I. Deystviye sernoy  
kisloty na dietildietoksisilan i yego smesi s trietiletoksi-  
silanom)

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 4, pp 1270-1275  
(USSR)

ABSTRACT:

In the paper under review the authors give data concerning  
their work during 1947 in the field of the preparation of  
liquid polydiethylsiloxanes from diethyldiethoxysilane and its  
mixtures with triethylethoxysilane. It was the objective of  
this work to synthesize polymeric liquids free from impurities  
of those polymers which contain ethoxy groups in the molecule.  
The hydrolysis of diethyldiethoxysilane in an aqueous medium  
at 100° resulted in the formation of the diethyldioxy- and  
oxyethoxysilanes which, in turn, were transformed into poly-  
diethylsiloxanes of cyclic and normal structures (Scheme I).  
Under different conditions the formation of polymers containing

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SOV/79-29-4-51/77

Polydiethylsiloxane Liquids. I. The Effect of Sulphuric Acid on Diethyldiethoxysilane and Its Mixtures With Triethylethoxysilane

the ethoxy group (b) in the molecule could not be avoided. The synthesis of polydiethylsiloxanes free from ethoxy groups on the basis of the hydrolysis products of diethyldiethoxysilane was carried out by means of a reaction with 93-100% sulphuric acid at 20-50° as well as with 95-99% formic- or acetic acid at 60-100° according to scheme (II). When sulphuric acid was used the fractional composition of polydiethylsiloxanes changed abruptly toward the formation of polymers of a higher average molecular weight (Scheme III). The carboxylic acids did not cause a regrouping of the cyclic polymers (Scheme II, Table 1). On the basis of what has been reported so far it was possible to assume that the synthesis of polydiethylsiloxanes free from polymeric impurities containing ethoxy groups in the molecule by the action of concentrated acids (esp. sulphuric acid) upon diethyldiethoxysilane follows the general scheme (IV)

$$(\text{C}_2\text{H}_5)_2\text{Si}(\text{OC}_2\text{H}_5)_2 + 2 \text{H}_2\text{SO}_4 \rightarrow [(\text{C}_2\text{H}_5)_2\text{SiO}]_x + 2\text{C}_2\text{H}_5\text{OSO}_3\text{H} + \text{H}_2\text{O} \text{ (IV)}$$

This assumption was confirmed by experiments. Thus, ethyl sulphuric acid and cyclic polydiethylsiloxanes free from normal polymers with ethoxy groups in the molecule were ob-

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SOV/79-29-4-51/77

Polydiethylsiloxane Liquids. I. The Effect of Sulphuric Acid on Diethyldiethoxysilane and Its Mixtures With Triethylethoxysilane

tained (98% yield). The investigation of the influence of various factors upon the process and composition of the resulting polydiethylsiloxanes made it possible to illustrate the main transformations in the schemes (V), (VI), (VII), and (IX), which was also confirmed experimentally. There are 4 tables.

SUBMITTED: March 10, 1958

Card 3/3

5 (3)

AUTHORS: Leznov, N. S., Sabun, L. A.,  
Andrianov, K. A.

SOV/79-29-4-52/77

TITLE: Polydiethylsiloxane Liquids (Polidietilsiloksanovyye zhidkosti).  
II. The Effect of Phosphoric- and Boric Acid on Diethyldiethoxy-  
silane and Its Mixtures With Triethylethoxysilane (II. Deystviye  
fosfornoy i bornoy kislot na dietildietoksisilan i yego smesi s  
trietiletoksisilanom)

PERIODICAL: Zhurnal obshchey khimii, 1959, Vol 29, Nr 4, pp 1276 - 1281  
(USSR)

ABSTRACT: In continuation of the preceding paper (ZOC 1959, 29, 1270) the  
data concerning the reactions of phosphoric- and boric acid  
with ethylethoxysilanes are described in the present article.  
It was shown that, like sulphuric acid, phosphoric acid react-  
ing with diethyldiethoxysilane results in a formation of poly-  
diethylsiloxanes free from impurities of normal polymers with  
ethoxy groups in the molecule, and in the formation of acid  
ethyl phosphates. This formation is brought about at a molar  
ratio of diethyldiethoxysilane to the acid of 3:2 up to 1:2.  
There was no neutral ester to be found in the reaction products.

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In contrast with the reaction of diethyldiethoxysilane with

Polydiethylsiloxane Liquids. II. The Effect of Phosphoric- SOV/79-29-4-52/77  
and Boric Acid on Diethyldiethoxysilane and Its Mixtures  
With Triethylethoxysilane

sulphuric acid (Scheme I) the reaction with phosphoric acid exhibits an intermediate stage in which polydiethylsiloxane phosphates form, which are stable in the middle of the reaction according to scheme (II). If water influences the reaction product, a hydrolysis of the phosphates accompanied by the separation of polydiethylsiloxanes and acid ethyl phosphates takes place according to schemes (III) and (IV). It proved impossible to remove the polydiethylsiloxane phosphates since the distillation of the reaction material resulted in their decomposition. Their presence was proved in three ways. The data obtained support the assumption that two kinds of polydiethylsiloxane phosphates are present in the reaction product (Scheme II). In the hydrolysis (Scheme III) it may be seen that polydiethylsiloxane phosphates exhibit a polymeric grouping as soon as the acid ethyl phosphate is split off. A further condensation results in non-distillable polymers of high molecular weight. In this hydrolysis (Scheme IV) individual polymer components, the cyclization of which results in low-boiling products, liberate themselves. The effect of phosphoric acid on a mixture of diethyl-

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Polydiethylsiloxane Liquids. II. The Effect of  
Phosphoric- and Boric Acid on Diethyldiethoxysilane  
and Its Mixtures With Triethylethoxysilane

SOV/79-29-4-52/77

diethoxysilane and triethylethoxysilane follows scheme (V), as is also the case with sulphuric acid. The reaction with boric acid in place of phosphoric acid takes place in the same way (Schemes VIII and IX). The fractional compositions of the polymers obtained by the reactions of both acids are similar. There are 3 tables.

SUBMITTED: March 10, 1958

Card 3/3

5 (3)  
AUTHORS:

Andrianov, K. A., Zhdanov, A. A.  
Kazakova, A. A.

SOV/79-29-4-53/77

TITLE:

Synthesis of the Polymers With Inorganic Molecule Chains  
(Sintez polimerov s neorganicheskimi tsepyami molekul).  
I. Polyorganosiloxyphosphoaluminumoxans (I. Poliorganosiloksifosforalyumoksany)

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 4, pp 1281 - 1284  
(USSR)

ABSTRACT:

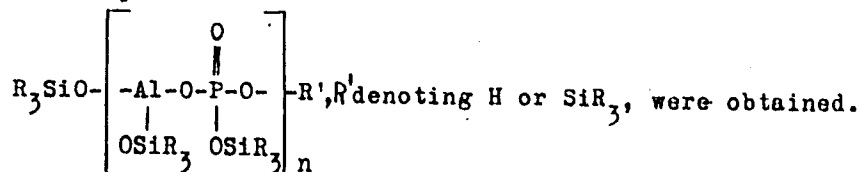
In continuation of the preceding report (Ref 1) the investigations under review show that the polyalkylsiloxyaluminum phosphates are obtained by the polycondensation of the tris-(trialkylsiloxy)-aluminum with organo-phosphosilicon compounds according to schemes 1) and 2). The nature of the resulting polymers depends on the nature of the organic radical in the surrounding trialkylsiloxane groups. By the condensation of tris-(triethylsiloxy)-aluminum with triethylsiloxyphosphinic acid or tris-(triethylsilyl)-phosphate at 200-220° polymers were obtained which changed to an insoluble, not meltable, and solid state above the afore-mentioned temperature. Under the same conditions solid, not meltable, and insoluble products were

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Synthesis of the Polymers With Inorganic Molecule  
Chains. I. Polyorganosiloxaphosphoaluminumoxans

SOV/79-29-4-53/77

also obtained by the use of trimethylsiloxaphosphinic acid. In order to confirm the scheme mentioned 2 mols of tris-(triethylsiloxo)-aluminum were condensed with 1 mol of triethylsiloxaphosphinic acid. In this way the condensation product (III) of low molecular weight was obtained; hexaethyldisiloxane and water were eliminated in quantities corresponding to scheme 2. The analysis of the product corresponds to the formula given in scheme 2. By the same condensation, which was, in this case, carried out with equimolecular quantities, solid polymers of the composition



Powder, not meltable products which were, at the same time, insoluble in organic solutions resulted from the condensation of tris-(trimethylsiloxo)-aluminum with trimethylsiloxaphosphinic

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Synthesis of the Polymers With Inorganic Molecule  
Chains. I. Polyorganosiloxyphosphoaluminumoxans

SOV/79-29-4-53/77

acid or with tris-(trimethylsilyl)-phosphate. There are 2  
figures and 5 references, 4 of which are Soviet.

SUBMITTED: March 15, 1958

Card 3/3



5(3)

AUTHORS:

Kudryavtsev, R. V., Kursanov, D. N., Andrianov, K. A. SOV/79-29-5-20/75

TITLE:

Investigation of the Reaction Mechanism of the Formation of Polyorganoboron-Siloxanes by Means of the Heavy Oxygen Isotope  
(Izucheniye mekhanizma reaktsii obrazovaniya poliorganoborosiloksanov s pomoshch'yu tyazhologo izotopa kisloroda)

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 5, pp 1497 - 1499 (USSR)

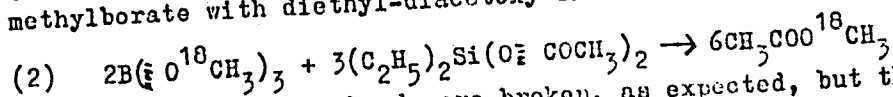
ABSTRACT:

In the present paper the breaking of the chains was investigated, that takes place during the formation of polyorganoboron-siloxanes. For this purpose trimethyl borate and tetramethoxy-silane with a higher concentration of the heavy oxygen isotope  $O^{18}$  (excess of  $O^{18}$  0.40 at%) were prepared. By interaction of tetramethoxy-silane and triacetoxo-boron according to scheme (1)  
(1)  $3Si(O^{18}CH_3)_4 + 4B(O_2COCH_3)_3 \rightarrow 12CH_3COO^{18}CH_3$   
methyl acetate was obtained. It contained the total excess- $O^{18}$ . Accordingly, a breaking of the Si-O and O-C-bonds takes place there. The O-C-bonds in tetramethoxy-silane and B-O-bonds in

Card 1/3

Investigation of the Reaction Mechanism of the Formation of Polyorganoboron-Siloxanes by Means of the Heavy Oxygen Isotope SOV/79-29-5-20/75

triacetoxy-boron are maintained. During the reaction of tri-methylborate with diethyl-diacetoxy-silane according to scheme (2)



not the C-O- and Si-O-bonds are broken, as expected, but the B-O- and O-C-bonds. Possibly both the interaction of tetra-methoxy-silane with triacetoxy-boron and the interaction of tri-methyl borate with diethyl-acetoxy-silane proceeds according to cyclic mechanisms. The reaction, however, can practically not be carried out in absolutely anhydrous conditions. Traces of water in the components or in the reaction medium cause a hydrolysis of one of the initial components. Methyl alcohol

$CH_3O^{18}H$  or acetic acid is separated which causes either an alcoholysis (Ref 4) or acidolysis of the other initial components and the formation of methyl acetate. Thus the processes covered by equations (1) and (2) can contain several groups of reactions. All these reactions have one common feature: in all cases the

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Investigation of the Reaction Mechanism of the Formation SOV/79-29-5-20/75  
of Polyorganoboron-Siloxanes by Means of the Heavy Oxygen Isotope

$O^{18}-CH_3$ -bond is maintained. The formation of  $CH_3COO^{18}CH_3$  is accompanied on one hand by the rupture of the  $B-O^{18}CH_3$ -or the  $Si-O^{18}CH_3$ -bond and on the other hand by the rupture of the  $SiO-COCH_3$ - or  $BO-COCH_3$ -bond. There are 7 references, 4 of which are Soviet.

ASSOCIATION: Institut elementoorganicheskikh soyedineniy Akademii nauk SSSR  
(Institute of Elemental Organic Compounds of the Academy of Sciences, USSR)

SUBMITTED: March 21, 1958

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5 (3)

AUTHORS:

Andrianov, K. A., Odinets, V. A.,  
Zhdanov, A. A.,

SOV/79-29-5-21/75

TITLE:

On the Reaction of Acylation of Arylaliphatic Disiloxanes  
(O reaktsii atsilirovaniya arilalifaticheskikh disiloksanov).  
Synthesis of Bis-(4,4'-Acetobenzyl)-tetramethyl-disiloxane  
(Sintez bis-(4,4'-atsetobenzil)-tetrametildisiloksana)

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 5,  
pp 1499-1503 (USSR)

ABSTRACT:

The authors concluded from the formation of benzyl methyl chloro-silanes and acylation of benzyl-trimethyl silane that the Friedel-Crafts reaction may be successfully applied to the synthesis of various benzyl siloxane derivatives in which the aromatic nucleus is separated from the silicon atom by the methylene group. Experiments indicated that benzyl-dimethyl-chloro-silane is not destroyed in the presence of aluminum chloride and can be used as initial product for the synthesis of bis-(acetobenzyl)-tetramethyl-disiloxane. The benzyl-dimethyl-chloro silane was prepared according to the Grignard reaction from dimethyl-dichloro-silane and benzyl magnesium chloride. The synthetic bis-(acetobenzyl)-tetramethyl-

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On the Reaction of Acylation of Arylaliphatic  
Disiloxanes. Synthesis of Bis-(4,4'-Acetobenzyl)-tetramethyl-disiloxane

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disiloxane has the properties of aliphatic-aromatic ketones and forms the dinitro-phenyl hydrazone in which case the reaction proceeds via both carbonyl groups. On oxidation of the bis-(acetobenzyl)-tetramethyl-disiloxane with sodium hypobromide in alkali the toluic acid is formed which was identified in the form of its methyl ester. A comparatively easy separation of the benzyl carboxy-group is connected with the displacement of the reactivity in the system of the conjugated nuclear bonds. In consequence of it a decrease of the electron density on the silicon nucleus and subsequent rupture of the Si-C-bond takes place under the influence of nucleophilic agents. When using alkaline potassium solution, the oxidation is complete and terephthalic acid is formed. The formation of the p-toluic and terephthalic acid indicates that the aceto-group comes into para-position with respect to the methylene group during the Friedel-Crafts reaction. Properties of the compounds synthesized are given in the table. There are 1 table and 6 references, 4 of which are Soviet.

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On the Reaction of Acylation of Arylaliphatic Disiloxanes. Synthesis of Bis-(4,4'-Acetobenzyl)-tetramethyl-disiloxane SOV/79-29-5-21/75

ASSOCIATION: Institut elementoorganicheskikh soedineniy Akademii nauk SSSR  
(Institute of Elemental-Organic Compounds of the Academy of Sciences, USSR)

SUBMITTED: April 3, 1958

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5 (3)

AUTHORS:

Andrianov, K. A., Zhinkin, D. Ya.,  
Kuznetsova, A. G.

SCV/79-29-5-22/77

TITLE:

On the Common Hydrolysis of Diethyl-dichloro-silane and  
Phenyl-trichloro-silane (O sovmestnom gidrolize  
diethylidikhlorosilana i feniltrikhlorsilana)

PERIODICAL:

Zhurnal obshchey khimii, 1958, Vol 29, Nr 5, pp 1504-1507  
(USSR)

ABSTRACT:

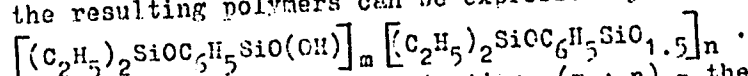
In the present paper the results obtained in the common  
hydrolysis of equimolar mixtures of diethyl-dichloro-silane  
and phenyl-trichloro-silane are discussed. The reaction  
process can proceed in two concurrent directions. In one case  
a mixture of polymeric products of the hydrolysis which took  
place separately, is formed - of polydiethyl siloxanes and  
polyphenyl-siloxanes. In the second case products of the  
co-hydrolysis are formed - the polyethyl-phenyl-siloxanes.  
In order to determine the direction of the course of reaction  
the products of the co-hydrolysis of the above-mentioned  
monomers were investigated. To be able to interpret the results  
obtained, the data determined in the analysis were compared  
with the values calculated for the individual polymers

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On the Common Hydrolysis of Diethyl-dichloro-silane  
and Phenyl-trichloro-silane

SOV/79-29-3-22/75

(Table 1). On the determination of the mean molecular weights of fractions of the co-hydrolysis products the molecular weights and the dispersity of these products were found to depend on the solvent used (Fig). The products obtained on the co-hydrolysis of diethyl-dichloro-silane and phenyl-trichloro-silane with excess water were investigated. It may be stated from the results obtained that the composition of the resulting polymers can be expressed by the formula



$(m + n)$  - degree of polymerization,  $(m : n)$  - the ratio of polydiethyl-phenyl-hydroxy- and polydiethyl-phenyl siloxanes. The mean values of these coefficients are given in table 2. As can be seen the influence of the solvent does not only concern the dispersity of the polymeric mixture and the degree of polymerization but also the quantity of the hydroxyl-containing compounds occurring in the hydrolysis products. The maximum content of hydroxyl groups is found in the hydrolysis products in ether, the minimum in benzene. There are 1 figure, 2 tables, and 3 Soviet references.

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5 (3)  
AUTHORS:

Leznov, A. S., Sabun, L. A.,  
Andrianov, K. A.

TITLE:

Polydiethyl-siloxane Liquids (Polidietilsilol'noyevyye  
zhidkosti). 3. Effect of Carboxylic Acids upon Diethyl-  
ethoxy-silane (3. Deystviye karbonovykh kislot na  
dietildietoksisilan)

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 5,  
1500-1514 (USSR)

ABSTRACT:

The present paper supplies data of the reactions of diethyl-  
diethoxy-silane with mono- (Table 2) and dicarboxylic acids  
(Table 3). The investigation of these reactions indicated  
that on heating of monocarboxylic acids (formic, acetic, chloro-  
acetic, propionic and n-butyric acid) with diethyl-diethoxy-  
silane up to 66-120° polydiethyl-siloxanes (up to 98 %) and  
ethyl esters of the corresponding acids (up to 90 %) are  
formed. Cyclic polydiethyl-siloxanes, without linear polymers  
with ethoxy-groups in the molecule can be obtained if excess  
acid is used in the reaction. The latter depends on the acid  
concentration and its dissociation constant and increases  
with an increase in the latter (Table 1). The reaction rate

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Polydiethyl-siloxane Liquids. 3. Effect of  
Carboxylic Acids Upon Diethyl-ethoxy-silane

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of the carboxylic acids with diethyl-ethoxy-silane depends on the strength of the acid and increases with its increasing strength (Fig). Polydiethyl siloxanes formed in the reactions of monocarboxylic acids with diethyl-ethoxy-silane are practically completely distilled off up to 300° (1 mm). Their fractional composition depends, in contrast with the polydiethyl-siloxanes formed in reactions of alcohol acids with diethyl-diethoxy-silane, neither on the nature nor on the quantity or configuration of the acid. The investigation of the reactions of diethyl-diethoxy-silane with dicarboxylic acids (oxalic, succinic, adipic and malic acid) indicated the same laws as with monocarboxylic acids. In a similar way as in reaction with monocarboxylic acids traces of sulfuric acid accelerate the course of reaction and permit the reduction of the excess acid desirable for the formation of polydiethyl-siloxanes. The fractional composition of the polydiethyl-siloxanes is similar to the composition of those which are formed in the reaction with monocarboxylic acids and is also independent of the nature of the acid. It may be

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Polydiethyl-siloxane Liquids. 7. Effect of Carboxylic Acids Upon Diethyl-ethoxy-silane 507/79-29-5-23/75

concluded from this that polydiethyl-siloxanes are stable against the effect of carboxylic acids. There are 1 figure, 3 tables, and 2 Soviet references.

SUBMITTED: March 10, 1958

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5 (3)  
 AUTHORS: Leznov, N. S., Sebn, L. A., Andrianov, K. A. SOV/79-29-7-24/75

TITLE: Polydiethyl-siloxane Liquids (Polidietilsiloksanovyve zhidkosti). 4. Effect of Aldehydes and Acetone on Diethyl-diethoxy-siloxane (4. Deystviye al'degidov i atsetona na dietildietoksisilan)

PERIODICAL: Zhurnal obshchey khimii, 1959, Vol 29, Nr 5, pp 1514-1518 (USSR)

ABSTRACT: The authors found that on the interaction of diethyl-diethoxy-silane with aqueous aldehyde solutions the latter do not take part in the reaction and that the process results in the hydrolysis of the diethyl-diethoxy-silane. Anhydrous aldehydes and acetone are completely passive in the absence of catalysts with respect to diethyl-diethoxy-silane. Irrespective of the time of heating of the reaction mixture neither polydiethyl siloxanes nor acetals could be detected in the reaction products. When using mineral acids hydrochloride and its solutions were not found to cause any interaction between aldehydes and diethyl-diethoxy-silane. Sulfuric acid, however, effects in amounts of 0.1-0.2 % the formation of polydiethyl

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